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Recent bean leaf beetle and bean pod mottle virus research

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INTEGRATED CROP MANAGEMENT

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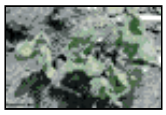
Soybean growers face a dilemma when considering management options for bean leaf beetles and bean pod mottle virus. Rayda Krell recently completed a research program at Iowa State University that focused on immediate solutions for this pest problem. This article summarizes her research from which we suggest some short-term management options.



Heavy feeding by bean leaf beetles causes scarred cotyledons, defoliated leaves, and stunted soybean seedlings.

Enlarge [1]

Ecology

One of the first steps in managing a pest organism is to understand its distribution and abundance (i.e., ecology). For example, knowing the rate of bean leaf beetle movement within or between soybean fields could allow more efficient management of bean pod mottle virus. One of Rayda's research components was monitoring the flight capacity of bean leaf beetles that were attached to a computer-monitored flight mill to record flight distance for 24 hours. Beetles (171 females) flew an average of 26 flights each and for more than 9 minutes. Most beetles (71 percent) flew less than 167 feet (average flight was 36 feet) with beetles collected in August flying the farthest. These studies indicated that overwintered beetles remain within fields after colonizing soybean in the spring; therefore, support is given to our management tactics during the field season. Thus, if beetles do not move between soybean fields early in the season, insecticide treatments will be more effective.

Bean pod mottle virus inoculum

Bean pod mottle virus is found throughout Iowa. Primary sources of inoculum for bean pod mottle virus included overwintered bean leaf beetles, seed-transmission from infected seed, and an alternate host (showy tick trefoil). Although the impact of these sources on soybean is not fully known, the earlier soybean is infected with virus the greater the effect on yield and seed quality. The combined effect of all inoculum sources may be important. Therefore, targeting a single inoculum source with a single management tactic to break the disease cycle may not be possible.

Short-term management

Rayda's studies also provided insight into how a short-term management strategy could be developed for bean pod mottle virus. Studies were conducted in 2000-2003 to examine, in separate experiments, timed applications of Warrior (2.5 oz/acre) and planting dates (four dates, from mid-March through mid-June).

Insecticide applications

Three chemical control tactics (one early-, two early-, one early- and mid-season Warrior application, and an untreated check) were used on large plots (at least 500 ft in length and 48 rows in width). Commodity and food-grade soybean were used, and the efficacy of the management tactics was assessed by many factors (e.g., beetle counts, seasonal virus incidence, virus incidence in seed, seed damage and mottling, and yield). Bean leaf beetles were most abundant in the untreated check during the majority of the growing season. One early- and mid-season Warrior application performed the best, having the lowest amount of virus (less than 40 percent, an economic level of damage), best seed quality, and highest yield. The best-performing treatment would have cost $14/acre with the average price of soybean during the study years being $4.50/bushel. At these two prices, the gain threshold (i.e., break-even yield) was 3.11 bushels/acre; the optimal treatment protected yield by 6.5 bushels/acre. Additionally, the one early- and mid-season Warrior application kept second-generation beetle populations below economic thresholds for pod feeding. This finding indicates that growers managing for bean pod mottle virus may not need to treat soybean for late-season pod injury.

Soybean planting date

Finally, Rayda examined the potential of soybean planting date, a potential cultural method of managing bean pod mottle virus. Planting dates were determined based on growing degree days planted at 34, 78, 217, and 387 base 10°C. Small plots were used (four or eight rows less than 50 feet in length). These small plot sizes probably contributed to beetle movement between plots, and thus no significant differences were detected between planting date and bean pod mottle virus. However, a mid-May planting date may be a sufficient starting point for reducing initial virus transmission. No adverse affects were found by planting later in this study. This study concluded that not planting early is an option with few risks and some possible benefits, including reduced bean leaf beetle populations and a reduction in bean pod mottle virus incidence.

We are currently studying longer-term management strategies for this pest complex and will present our findings as they become available.

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